

CLAIMS

1 - A single-phase electromagnetic actuator with torque due to the constant current over the major part of the useful travel and with magnetic restoring torque around a stable zero-current rest position, containing a fixed device (1) comprising a stator circuit excited by at least one electric coil, and a rotatably movable device (2) provided with a thin magnet having 2N pairs of magnetic poles magnetized in alternating senses perpendicular to the transverse plane of the annular sectors, the actuator also containing restoring means to return the movable device (2) to a predetermined angular rest position, characterized in that the restoring means are magnetic or magnetostatic means comprising a thin auxiliary restoring magnet (34) disposed in the air gap, having 2N pairs of magnetic poles magnetized in alternating senses and integral with the stator poles.

2 - A single-phase electromagnetic actuator with torque due to the constant current over the major part of the useful travel according to claim 1, characterized in that the rotor poles and the magnetic poles of the auxiliary restoring magnet have the form of thin annular sectors.

3 - A single-phase electromagnetic actuator with torque due to the constant current over the major part of the useful travel according to claim 1, characterized in that the rotor poles and the magnetic poles of the auxiliary restoring magnet have tubular form.

4 - A single-phase electromagnetic actuator with torque due to the constant current over the major part of the useful travel according to any one of the preceding claims, characterized in that the auxiliary restoring magnet is bonded onto the stator poles in such a position that the zero-current equilibrium position of the rotor corresponds to the sought zero-current position.

5 - A single-phase electromagnetic actuator with torque due to the constant current over the major part of the useful travel according to any one of the preceding claims, characterized in that the rotor cooperates with the fixed device (1) through a thrust ball bearing which limits displacement of the rotor toward the fixed device, the said thrust ball bearing being substantially coplanar with the plane passing through the end of the stator poles, the auxiliary magnet being formed by a magnetic disk with  $2N$  poles containing a central recess whose cross section is at least as large as the cross section of the thrust ball bearing.

6 - A single-phase electromagnetic actuator with torque due to the constant current over the major part of the useful travel according to any one of the preceding claims, characterized in that the rotor magnet is integral with a yoke of soft magnetic material.

7 - A single-phase electromagnetic actuator with torque due to the constant current over the major part of the useful travel according to any one of the preceding claims, characterized in that the stator is

also provided with a fixed closure yoke made of soft magnetic material.

8 - A valve, especially an air intake valve for an internal combustion engine, driven by a single-phase actuator with torque due to the constant current over the major part of the useful travel, containing a fixed device (1) comprising a stator circuit excited by at least one electric coil, and a rotatably movable device (2) provided with a thin magnet having 2N pairs of magnetic poles magnetized in alternating senses, the actuator also containing restoring means to return the movable device (2) to a predetermined angular rest position, characterized in that the restoring means comprise a thin auxiliary restoring magnet disposed in the air gap, having 2N pairs of magnetic poles magnetized in alternating senses and integral with the stator poles.

9 - A valve, especially an air intake valve for an internal combustion engine, according to claim 6, characterized in that the auxiliary restoring magnet is disposed such that the rest position corresponds to partial opening of the air intake.